

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stability characteristics of compressible boundary layers over thermo-mechanically compliant walls FABIAN DETTENRIEDER, DANIEL BODONY, University of Illinois at Urbana-Champaign — Transition prediction at hypersonic flight conditions continues to be a challenge and results in conservative safety factors that increase vehicle weight. The weight and thus cost reduction of the outer skin panels promises significant impact; however, fluid-structure interaction due to unsteady perturbations in the laminar boundary layer regime has not been systematically studied at conditions relevant for reusable, hypersonic flight. In this talk, we develop and apply convective and global stability analyses for compressible boundary layers over thermo-mechanically compliant panels. This compliance is shown to change the convective stability of the boundary layer modes, with both stabilization and destabilization observed. Finite panel lengths are shown to affect the global stability properties of the boundary layer.

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Date submitted: 31 Jul 2017

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